Morphological Mutation Function

The general form of a morphological mutation function is:

$$M = mut(S_1, S_2, \Omega)$$

where:

M is the resultant mutant morphology
S_1 is the source morphology
S_2 is another (source) morphology
Ω is the index of mutation (0 - 1)

Note, the word "target" has generally been dropped, because there is no reason to distinguish between "source" and "target."

Figure 7. An IUIM mutation, showing ten intermediary spectral mutants.

Figure 8. A UUIM mutation, showing ten intermediary spectral mutants.

Figure 9. An ISIM mutation, showing five intermediary spectral mutants.

Figure 10. An LCM mutation, showing five intermediary spectral mutants.

Figure 11. An LCM/IUIM mutation, showing three intermediary spectral mutants.

Figure 12. LCM/UUIM mutation, showing six intermediary spectral mutants.

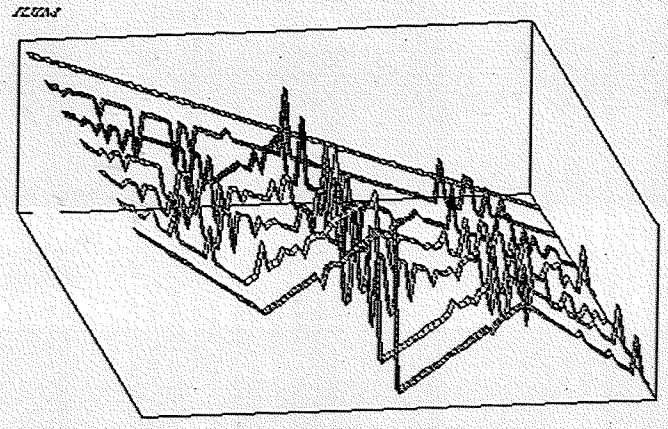

Figure 7

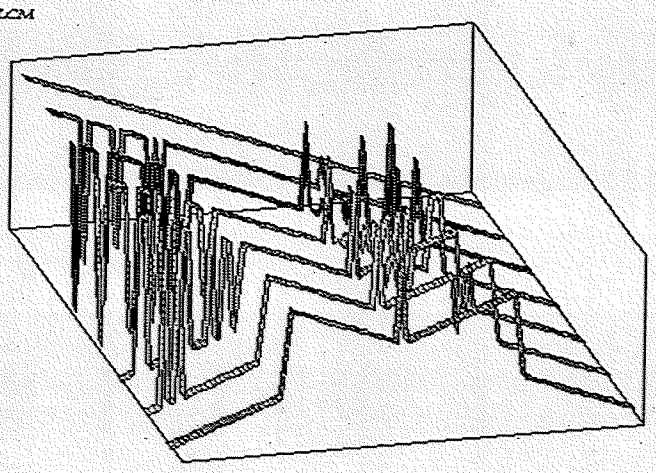

Figure 10

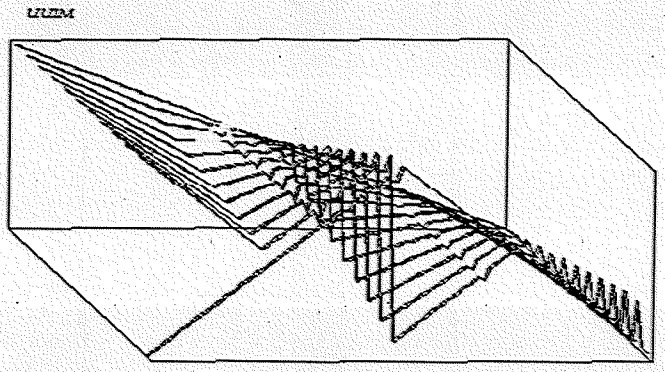

Figure 8

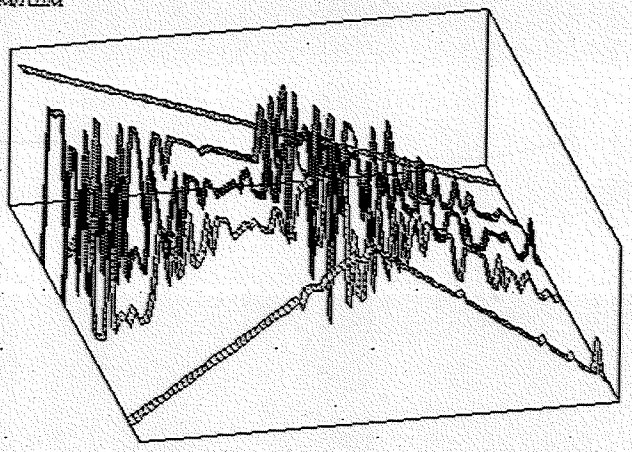

Figure 11

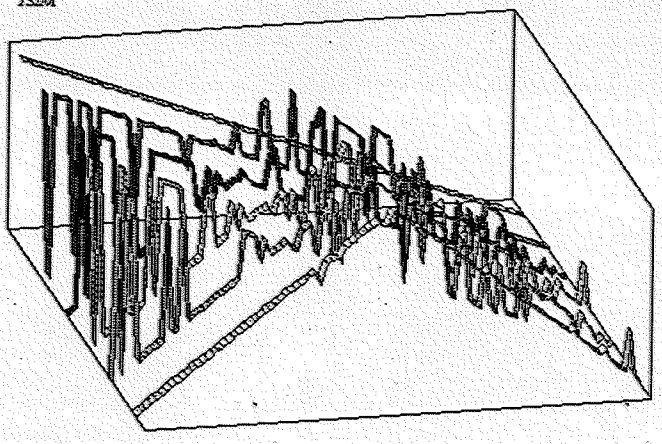

Figure 9

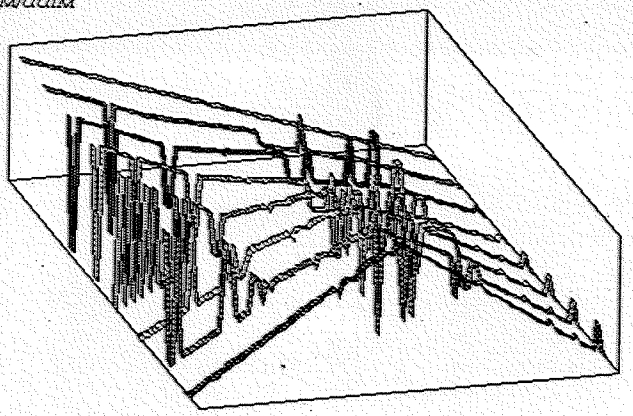

Figure 12

Figure 5. Spectral interpolation (USIM) of the sawtooth spectral shape to the randomly perturbed triangle spectral shape.

Figure 6. A USIM mutation, showing ten intermediary spectral mutants. The x-axis is spectral band, the y-axis is spectral amplitude, and the z-axis is time. The source "morphology" is a sawtoothed spectral configuration; the target is a randomly perturbed triangular one.

Table 2. Fundamental mutation functions

Mutation	*Mutation Function(s)*
USIM Uniform Signed Interval Magnitude	$M_i = M_i + (S_{mi}) + \Omega * (T_{mi} - S_{mi})$
UUIM Uniform Unsigned Interval Magnitude	$M_i = M_i + S_{sgn} * (S_{mag} + \Omega * \lvert T_{mag} - S_{mag} \rvert)$ where S_{mi} and T_{mi} are $(S_{sgn} * S_{mag})$ and $(T_{sgn} * T_{mag})$, respectively
LCM Linear Contour Mutation	$M_i = M_i + T_{sgn} * S_{mag}$ (general form for mutated intervals) $M_i = M_i + S_{sgn} * S_{mag}$ (general form for non-mutated intervals)
IUIM Irregular Unsigned Interval Magnitude	$M_i = M_i + S_{sgn} * T_{mag}$ (for mutated intervals; non-mutated intervals same as LCM above)
ISIM Irregular Signed Interval Magnitude	$M_i = M_i + T_{sgn} * T_{mag}$ (for mutated intervals; non-mutated intervals same as LCM above)

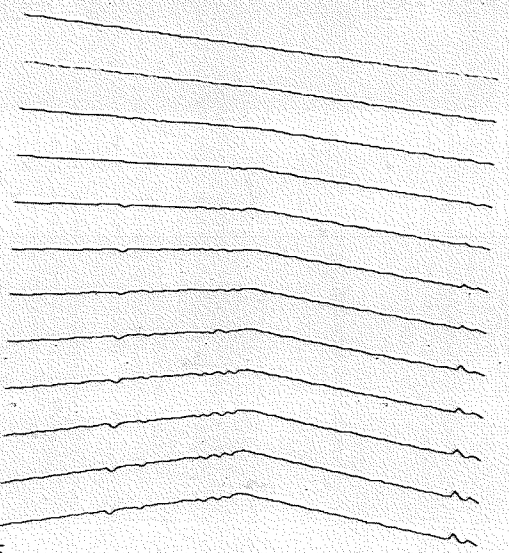

Figure 5

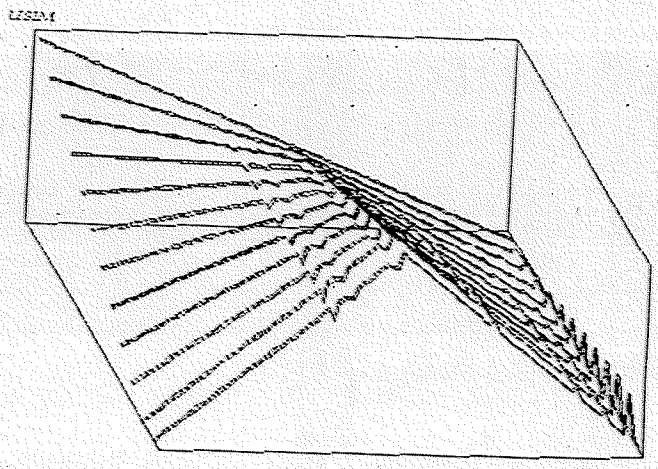

Figure 6

used: M_i becomes the absolute amplitude value to which the new interval is added, computed as some combination of T_{sgn}, S_{sgn}, T_{mag}, and S_{mag}.

The irregular mutations are in two forms—one for the case when that particular frequency band is chosen for mutation, one for when it is not. A number of stochastic algorithms are used in Soundhack for determining which frequency bands are mutated according to the value of Ω.

Visual Examples of the Mutations

The example in Figure 5 shows the USIM from a sawtooth spectral shape to a randomized triangle one. The next seven examples (in Figures 6 through 12) show each of the mutations on the same two functions, plotted over up to ten gradually increasing Ω values from 0 to 1. In the case of the incomplete mutations (LCM, UUIM, and IUIM) the final triangular function is not shown (nor arrived at). For the sake of visual clarity in some of the more complex mutations, fewer intermediary functions are shown. All mutations use absolute intervals of .5, with a maximum amplitude of 1.0.